

Abstract of the Disclosure

A microelectrical mechanical system (MEMS) actuator having electrically conductive coils that create first magnetic fields that are opposed by a second magnetic field is disclosed. The actuator includes two coils having dual, interspersed Archimedean spirals. Within an actuator, one coil is arranged with spirals that proceed clockwise, while the other coil is provided with spirals that proceed counterclockwise. An innermost portion of each coil is anchored to a substrate, but, because the coils are flexible, the outermost portions are free to extend upward, away from the substrate. An electrically conductive bridge mechanically couples the two coils of each actuator to a mirror. A plurality of actuators are located around the mirror to support the mirror and, when activated, to move an edge of the mirror. The coils are electrically coupled to a source of elevating current and control current. Elevating current provides a steady-state current through the coils that creates a magnetic field. A permanent magnet is located on a reverse side of the substrate that is arranged to provide a magnetic field of opposite polarity to the magnetic field of the coil. The opposing magnetic fields provide a force that urges the coils to expand so that the outermost portions of the coil extend upward, away from the substrate, and lift the bridge and mirror. Control current may then be modulated to increase and decrease the coil's magnetic field strength thereby increasing and decreasing the coil's extension to raise and lower relative to the substrate.